GALITZKY and WASSILJEFF[7] have studied the effect of boiled extract of wheat and bean seeds upon the respiration of living and killed (by treatment with acetone) wheat seedlings. In agreement with various other workers, they find that the extracts greatly increase the CO_2 output in both living and killed seedlings: 60 per cent in normally acid cultures, 117 per cent in neutral cultures, and 86 per cent in slightly alkaline cultures. The authors raise the question, "Is the stimulative action due to food materials supplied by the extract, or to bodies of the nature of co-enzymes?" L. and N. IWANOFF have assumed that the stimulation is due to the action of organic or inorganic phosphates on anaerobic respiration, analogous to the action of these bodies as co-enzymes for zymase. The authors find that peptone, glycerin, mannit, sodium lactate, quinic acid, sodium chlorid, and ferric chlorid have very little or no effect upon the respiration of the seedlings. Dextrose, saccharose, maltose, and sodium carbonate give a slightly increased CO_2 output, about 20 per cent. Arabinose and ferrous sulfate give a somewhat greater stimulation of the extracts. The authors consider it especially interesting that probable intermediate products of alcoholic fermentation, lactic acid and sodium lactate, have no stimulative effect. This is quite in contrast with conceptions of KOSTYTSCHEW. The authors are to extend the tests to various other substances, especially to phosphates, to see whether they will give the amount of stimulation shown by the extracts. One naturally wonders to what extent bacterial action may increase the CO_2 output. So far as methods are described, one certainly cannot be assured that such has not happened.—WILLIAM CROCKER.

Heliotropism and geotropism.—GUTTENBERG[8] has already shown, contrary to the earlier conception of most writers, that the effect of the geotropic stimulus is not annulled by the light stimulus, but that light of such intensity can be chosen that, when it strikes a horizontally placed orthotropic epicotyl from below, its joint action with gravity will, after various nutations, lead to the epicotyl permanently growing in the horizontal position. Compensation (placement at 45 above the horizontal) likewise results when the light of proper intensity strikes the vertical epicotyl horizontally. The intensity of light demanded to compensate gravity varies greatly with different epicotyls; while occasionally greater than one candle power, it is generally only a fraction of a candle power. RICHTER[9] called the results of GUTTENBERG into question,

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[7] GALITZKY, KATHERINE, und WASSILJEFF, VERA, Zur Atmung der Weizenkeime. Ber. Deutsch. Bot. Gesell. **28**:182–187. 1910.

[8] GUTTENBERG, H. R. v. Ueber das Zusammenwirken von Heliotropismus und Geotropismus in parallelotropen Pflanzenteilen. Jahrb. Wiss. Bot. **45**:193–231. 1907.

[9] RICHTER, O., Ueber das Zusammenwirken von Heliotropismus und Geotropismus. Jahrb. Wiss. Bot. **46**:481–502. 1909.

maintaining that the results were modified by the gaseous impurities of the laboratory in which they were obtained. GUTTENBERG,[10] on repeating his experiments in pure air, finds essentially the same compensatory values of light as he found in his earlier work. GUTTENBERG used the seedlings of *Avena* and *Brassica*, forms much less sensitive to impurities than are legumes, with which RICHTER worked. GUTTENBERG finds in *Vicia sativa*, contrary to RICHTER, that laboratory air does not increase the heliotropic sensitiveness, but in agreement with RICHTER he finds the geotropic irritability lessened. On this point, GUTTENBERG'S experiments are much more critical than RICHTER'S.—WILLIAM CROCKER.

Morphology of Phylloglossum.—A recent paper by WERNHAM[11] represent, a type, at the moment becoming much too common, in which a small basis of imperfectly examined facts is made to serve for large conclusions which are neither clearly nor logically drawn. The author has examined by means of serial sections the anatomy of two specimens of *Phylloglossum Drummondii*. He concludes that the basal leaves of this species (the protophylls of certain authors) are microphyllous, although superficially relatively large in sizes because their traces leave the stele without leaving any gap, as is the case with the Lycopsida. Concerning the relation of the sporophyll traces to the vascular system of the axis, the account is very obscure, since it is not made clear whether gaps are or are not present. The most remarkable feature of the article is the interpretation of the larger strand which passes off from the crown of the functional tuber toward the tuber of the succeeding year as a leaf trace. It has been regarded by other observers, apparently with good reason, as a branch supply, and the present author adduces apparently no valid evidence why this view of its nature should not continue to be held. On the basis of this imaginative interpretation, he comes to the conclusion that *Phylloglossum* was originally a megaphyllous form, which has become much reduced. It would be possible to prove almost anything with such reasoning as this. It seems highly desirable that morphologists should avoid eccentric conclusions of the nature illustrated by the article here reviewed. Obviously, conclusions of permanent value in regard to leaves or other organs can be reached only in the case where there is no room for doubt as to the morphological category of the structure under discussion.—E. C. JEFFREY.

Classification of conifers.—A new classification of conifers, based upon morphology, geographical distribution, and geological history, is proposed

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[10] GUTTENBERG, H. R. v., Ueber das Zusammenwirken von Geotropismus und Heliotropismus und die tropistische Empfindlichkeit in reiner und unreiner Luft. Jahrb. Wiss. Bot. 37:467–492. 1910.

[11] WERNHAM, H. F., The morphology of *Phylloglossum Drummondii*. Annals of Botany 24:335–347. *figs.* 8. 1910.